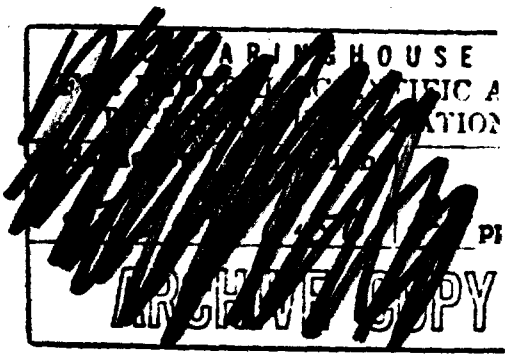
INTEGRATED GUIDANCE FOR SHELTER MANAGEMENT

SHELTER MANAGER'S GUIDE

A Technical Report



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(A Technical Report)

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Institute for Performance Technology
AMERICAN INSTITUTES FOR RESEARCH
Pittsburgh, Pennsylvania

ABSTRACT

The purpose of this project was to develop and evaluate in-shelter guidance materials which any fallout shelter manager, trained or untrain could use as an operational management guide.

An initial version of the Shelter Manager's Guide was used by both trained managers and emergent leaders in 24- and 48-hour habitability studies conducted by the American Institutes for Research.

After the Shelter Manager's Guide was revised, it was evaluated in an experimental comparison with other types of guidance materials.

The final product is arranged by priority of management decisions and actions within five shelter phases: Entry, Initial Organization and Operations, Routine, Temporary Emergence, and Contingencies (emergencies) It provides the management decision and actions necessary to organize and operate a fallout shelter, and supplies the information which the manager needs to support these decisions and actions.

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We would also like to acknowledge Mr. Fred Carr, of the Office of Civil Defense, who made many helpful suggestions during the course of this project.

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THE PROBLEM

During the Summer of 1964, the American Institutes for Research conducted a number of shelter management laboratory studies. In two of these studies, emergent leaders were allowed to organize the 20-person shelter during the absence of the trained shelter manager, using management guidance materials that had been developed for this study. After one exercise, the emergent leader being interrogated on the use of these guidance materials was nonplused when informed that, at the present time, no standard package of guidance materials was being stocked in public shelters. The emergent leader indicated that, without the aid of such reference materials, his task would have been much more difficult.

The research effort described in this report was directed towards preparing and testing a time-ordered Shelter Manager's Guide which could be used by either trained or untrained shelter managers. It was to supply three kinds of ready information: (1) the step-by-step decisions and actions which a manager must make to organize and operate a fallout shelter; (2) immediate answers to critical shelter problems or contingencies which may suddenly arise; and (3) the supporting details, such as actual procedures, personnel and equipment requirements, and background information.

APPROACH

The study involved six major steps:

1. The collection and systematic analysis of available data in order to derive shelter manager decisions and actions.
2. The priority ordering of these decisions and actions by functional area and by phase.

3. The use-testing of a draft version of the Shelter Manager's Guide in the shelter laboratory studies conducted as part of Contract Number OCD-PS-64-57, OCD Work Unit 1519A.

4. Evaluation of the content and usability of the Guide in a problem-solving experiment.

5. Revision and submission for review of the Shelter Manager's Guide and the preparation of this technical report.

6. Final verification of the priority order of the Entry and the Initial Organization and Operations phases by AIR expert judges.

Each of these steps is discussed in the following pages.

Data Collection and Analysis

The primary data sources for the Shelter Manager's Guide were:

1. Guide to Shelter Organization and Management (Bend, Griffard, Schaner, Shively, & Hudak, 1963).

2. Recent documents relating to specific aspects of shelter management which have been published since the completion of the above Guide.

A McBee-card information-retrieval system (see Appendix A for system categories) was set up with the following objectives:

1. To place on these cards all management decisions and actions by phase.

2. To indicate the page number where supporting information associated with these actions could be found.

Each identified management decision or action was written on the face of a separate card and multiple punches made for the following four fields:

1. Functions consist of 28 areas which require management decisions and actions for shelteree survival and well being. Tasks include topics such as food, water, radiological protection, communication, etc.

2. Subfunctions (or tasks) refer to the categories of work which make up a functional area. For example, the subfunctional areas for food include selection of food team, inventory, rationing, preparation, distribution, etc.

3. Variables stand for population or shelter characteristics that must be reflected in the development of guidance materials. Shelter size is among the most important of these variables, since guidance for many shelter activities should vary, depending upon whether the manager is dealing with 100 persons or 5,000 persons. Other important variables include: (a) shelter type, (b) shelter size, (c) shelter configuration, (d) degree of overcrowding, (e) shelter management background characteristics, (f) shelter population characteristics, (g) special shelter populations (e.g., children, the handicapped), and (h) special behavior problems (e.g., alcoholism, drug addiction).

4. Phases are temporal subdivisions of a shelter stay, each of which has a probable order or need, or sequence, and specific content for shelter management procedures. There are five phases in the present shelter analysis:

   a. Entry begins with the opening of the shelter and continues until initial actions and decisions necessary to survival and environmental safety are completed (probably one or two hours in most shelters).

   b. Initial organization and operations refers to the period of time (which may last one or two days) during which the procedures and personnel assignments

for all shelter operations and organization will be set up and implemented.

c. Routine takes up the majority of time spent in-shelter when the shelter is functioning on established procedures and schedules, and when shelterees are being trained both for in-shelter and post-shelter living.

d. Temporary emergence occurs when radiation levels have decreased to where teams may be sent out of the shelter on important missions. At some point in this phase, shelterees will be permitted to go outside the shelter entrance for a breath of fresh air. This will be a period of preparation for leaving the shelter.

e. Contingencies contain emergencies which can occur at any time. Each emergency that occurs can, in a sense, be considered a separate phase.

An analysis of the tasks and responsibilities of the shelter manager was then carried out based upon the data on the McBee cards. The goal of this analysis was to strip away extraneous information that might be more pertinent to a training or planning document; and to extract the management decisions, actions, and supporting information necessary to the actual organization and operation of a fallout shelter.

Establishment of Guidance Priorities

Upon completion of the shelter manager task analysis, the McBee cards were organized into two sequences. In the first sequence, the cards were initially put into the general functional areas set up in the code. Within each functional area, cards were arranged according to phase, and then

within each phase, according to the most likely order of operations. The second major arrangement organized the functional areas into a temporal priority.

Because the sequence of actions was considered to be most crucial in the Entry phase, particular attention was given to the design of a priority-ordered entry checklist.

The Development of Guidance Materials

A rough Shelter Manager's Guide for OCD community fallout shelters was developed from the system analyses. In order to use this Guide for the shelter management laboratory experiments which were set up for 20 and 40 people, respectively, a modified manual was written to fit the organization and operational guidance requirements for a small shelter (under 50 persons) using OCD stocks.

Based upon the findings and the critiques of the laboratory experiment, two draft products were prepared:

1. Shelter Manager's Guide for use in OCD community fallout shelters. The usability of the preliminary Guide was subsequently investigated in a problem-solving experiment. Based upon the results of this experiment, final revisions were made and the Shelter Manager's Guide was submitted to OCD for review.

2. Small Shelter Guide, a joint product of Work Units 1533A and 1542A, Contract Number OCD-PS-64-57, developed for use in a small non-OCD shelter (fewer than 50 persons). This Guide contains both planning and operational management guidance and will be submitted to OCD for review.

The Evaluation of Guidance Materials

Management Laboratory Studies

The Shelter Manager's Guide was evaluated in the laboratory studies using three sources of data:

1. Observations were noted by AIR staff members on the use of guidance materials during the exercise.
2. A debriefing session was held after each shelter run to review major developments of the shelter stay by the shelter manager and senior staff members, and debriefings were also held with the emergent leaders who had assumed command in two studies in which the trained manager was programmed to arrive after the exercise was underway.
3. A review and critique were made of the entire package of management guidance materials by the shelter manager after the completion of the laboratory studies.

Because the shelter laboratory exercises lasted wither 24 or 48 hours only guidance pertaining to the Entry and the Initial Organization and Operations phases could be tested. Another limitation on the evaluation of guidance materials from these exercises is due to the fact that guidance evaluation was not the primary goal of these laboratory studies. To the contrary, in accomplishing the primary goals of the experimental program, the trained shelter manager was required to follow a standardized, prearranged scenario of events, which meant that he had relatively little need to use the Guide as his basic in-shelter reference work.

The draft of the Shelter Manager's Guide did receive a test during two 24-hour exercises when emergent leadership had an opportunity to use the Guide. In one exercise, the appointed and trained manager appeared and assumed command two hours after the 19 persons had entered the shelter. In the second exercise, the manager did not assume command until the next morning, 12 hours after entry.

Although two exercises are insufficient to support any generalizations, the differences in the way the two emergent leaders utilized the in-shelter guidance materials may be of interest. These materials were placed on the wall with instructions for use in the absence of a trained manager printed in large letters on the cover. Included in the guidance package were an entry checklist, the other sections of the manual, and sets of cards describing the duties of the task teams.

The first emergent manager used the guidance as operational instructions to organize and run the shelter. Within two hours, he had established a working shelter organization. When the trained shelter manager asked for entry, the emergent leader had absorbed enough material from the manual to insist that the shelter manager show his credentials and that he be monitored for radiation.

In the other exercise, the emergent leader did not use the handbook directly, although his assistant read it and suggested procedures to him. However, he ignored or rejected several of the organizational recommendations in the guidance, and, as a result, the shelter organization was only implemented to handle problems which he deemed important to the stay, such as food and water distribution and sanitation facilities. Because he did not assign teams or units, security procedures, or radiological monitoring, the shelter was exposed to many potential management problems. See Laboratory Investigations of Shelter Management Factors (Hale, Rosenfeld, & Berkowitz, 1965), page 29, for a discussion of these problems.

In addition to the revisions based on the observed use of the manual, a review was made of all taped debriefings of the shelter manager. A list of suggestions, criticisms, and recommendations concerning in-shelter guidance was compiled, and selectively incorporated into the revised draft. Also, the trained actor-shelter manager reviewed the manual from the point of view of his personal experiences in-shelter and suggested changes in procedures and information, as well as modifications of the wording of the guidelines. The revised draft was then tried out for usability and content.

Management Guidance Tryout

The multiple-choice tests of management solutions to shelter problems were used to determine how long it is likely to take untrained persons to locate specific information in the Guide. Questions in one test concerned problems in a large (3,000-person) high-rise shelter, and questions in the other test concerned problems in a relatively small (200-person) basement shelter. Eight groups with ten male high school students in each were administered the tests; four groups the large- and four the small-shelter test. The groups are identified and results presented in Table 1.

The number of questions answered correctly by the different groups is of limited interest, because the multiple-choice items do not tap the primary intended capabilities of the Guide--forecasting and priority ordering problem areas, and identifying possible alternative solutions. Multiple-choice items of the type used in this tryout, on the other hand, emphasize the evaluation and selection of clearly specified alternatives. They were used for this tryout as an efficient technique for studying the time required to locate information in the Guide and to identify difficulties encountered in this location.

The estimated average reference times of 1.9 for the small-shelter problems and 2.4 for the large-shelter problems were judged to be excessive for problem solving under the time pressures of a nuclear disaster. The possibility of improving usability of the draft Guide was further suggested by the fact that reference times for the two documents not specifically designed for in-shelter use were substantially the same. Observations and detailed results from the tryout were used, in conjunction with the priority-order verification described in the next section, to suggest changes for improved access to information in the Guide. These changes are described on page 13.

Priority-Order Verification

An evaluation of the priority order, or sequence, of guidance presented in the Entry and the Initial Organization and Operations phases was performed using expert judgments.

Table 1

Identification of Tryout Groups and Results

Type of Guidance Provided	Small-Shelter Test			Large-Shelter Test		
	Mean Questions Answered Correctly	Mean Questions for Which Guidance Was Consulted	Average Reference Time (in min.)*	Mean Questions Answered Correctly	Mean Questions for Which Guidance Was Consulted	Average Reference Time (in min.)*
None	17.5	NA	NA	20.6	NA	NA
Shelter Manager's Guide (A 150-page draft of the product under development by AIR.)	21.4	22.6	1.9	21.3	26.1	2.4
Introduction to Shelter Management (A 200-page draft of the training manual under development by AIR.)	18.8	22.6	2.2	19.9	21.5	2.5
Guide for Community Fallout Shelter Management (SM-16.1) (A 100-page training and management document developed by OCD.)	17.6	18.9	2.1	18.6	21.5	2.2

Average reference time was estimated as follows: $\bar{r} = \frac{tg - tn}{Gg}$

Where: $\bar{r}$ is an estimate of the average reference time per question,
tg is the total testing time for group using guidance,
tn is the total testing time for the group using no guidance, and
Gg is the number of questions for which the guidance group made reference to the quidance.

Seven AIR judges, experienced in civil defense research, were given two randomly ordered lists containing all the functional areas, with samples of one subfunction or task within each area for the two phases--Entry and Initial Organization and Operations. The judges were asked to rank order these tasks in the sequence of probable need or importance to shelteree survival. The Entry phase contained 20 functional areas and the Initial Organization and Operations phase, 24 areas.

The ranking was analyzed in the following manner:

1. The mean and median ranks for each of the functional areas were determined

2. The average inter-judge reliability of median ranks was determined by utilizing Kendalls W (Walker & Lev, 1953, p. 285).

3. The reliability of all seven judges was determined by using the Spearman-Brown formula.

The rank order will be found in Tables II and III for the Entry and the Initial Organization and Operations phases, respectively. The reliability between any two judges and among all judges can be seen in Table IV.

The expert judgments were used in two ways: (1) to verify the present order of the majority of the Guide; and (2) to support, or help to decide, order changes in the rest of the Guide. See Tables II and III for each phase, including the present Guide order, the rank order of the experts, the authors' proposed changes, and the final revised order. Where the authors and the expert judges disagreed, the order of these task items was re-evaluated and a decision made. In cases where the authors have made a decision significantly contrary to the expert judges (where rank-order difference is greater than two) the rationale for the decision will be found in a footnote to the tables.

Table 11

Priority-Order Verification of the Entry Phase

Functional Titles	Order of Review Draft	Rank Order of Experts		Final Revised Order of Shelter Manager's Guide
		Based on Means	Based on Medians	
lap of the shelter	1	2	1	1
repare shelter for occupancy	2	1	2	2
ill the shelter	3	3	3	3
ssume command as soon as possible	4	4	4	4
ugment shelter supplies	5	8	8	5*
lose the shelter doors	6	5	5	6
et up a temporary shelter organization	7	6	6	7
iving groups	8	18	18	18
reparation for possible weapon's effects	9	7	7	8
nitial protective actions against fallout	10	11	12	9**
edical care	11	9	9	11**
ire	12	10	10	12
ater	13	13	11	13
quipment operation, repair, and maintenance	14	16	15	10***
ommunication	15	14	13	14
dministration	16	19	19	19
anitation	17	17	16	16
ood	18	15	17	17
anking	19	20	20	20
sychological support	20	12	14	15/

*Persons must return before door is closed.

**Shelter safety from fallout is considered to be of prime importance, since it affects the safety of all shelterees.

***If equipment is stocked, it will probably be crucial to shelter survival, and should be readied for operation as early as possible.

/All essential protective tasks should be completed prior to this consideration.

Table III

Priority-Order Verification of the
Initial Organization and Operations Phase

Functional Titles	Order of Review Draft	Rank Order of Experts		Final Revised Order of Shelter Manager's Guide
		Based on Means	Based on Medians	
Organization	1	2	1	1
Radiological protection	2	1	5	2*
Medical care	3	3	4	8**
Fire protection	4	11	12	9**
Safety	5	14	15	10**
Supply management	6	5	3	3
Equipment operation, repair, and maintenance	7	12	13	4***
Atmosphere control	8	16	16	5***
Lighting	9	4	2	6***
Power	10	9	10	7***
Communications outside the shelter	11	13	17	12/
Internal communications	12	10	11	11
Shelter administration	13	15	14	13
Water	14	6	7	14**
Sanitation	15	7	8	16**
Food	16	8	9	15**
Sleep	17	19	18	18
Social control	18	17	6	17//
Psychological support	19	18	20	19
Child care	20	20	21	21
Care of aged	21	22	22	22
In-shelter training	22	21	19	20
Recreation	23	23	23	23
Religious activities	24	24	24	24

*Shelter safety from fallout is considered to be of prime importance to all shelterees.

**Environmental safety has priority over physical needs such as non-emergency medical care, food, and water during the first hours.

***If equipment is stocked, it will probably be crucial to shelter survival, and should be made operational as soon as possible.

/Outside information may affect shelter actions that should be taken.

//From disaster research, it is not anticipated that this will be an early shelter problem.

Table IV

Inter-Judge Reliability

Phase	Average Correlation Between Pairs of Judges	Reliability of the Combined Judges
Entry	.698	.942
Initial Organization and Operations	.573	.904

CHANGES BASED ON TRYOUT AND VERIFICATION

Specific changes brought about as a result of the evaluation are as follows:

1. Tables of contents. A complex table of contents by functional areas and across phases was designed in lieu of an index. In addition, individual tables of contents for each phase were repeated on the back of each phase introduction page.

2. Internal reorganization. Each chapter was synthesized and reorganized under a consistent set of internal headings.

3. Revised sequences. Materials were re-evaluated and arranged to reflect a more practical order of priority.

4. Maximum simplification and condensation. All decisions and actions were reduced to those deemed essential, and wording of the guidelines was standardized and simplified.

The guidance materials in the final product were divided into five parts, representing the stages of a shelter stay: Entry, Initial Organization and Operations, Routine, Temporary Emergence, and Contingencies. Within all sections but two, the actions and decisions which a manager must

make in order to organize and operate a fallout shelter have been placed in a recommended sequential order, based on both importance and probable need. All supporting information directly follows each guideline. The Routine and Temporary Emergence sections have topics arranged in alphabetical order.

In addition to the above modifications, further revisions that were made, based on the verification of the priority order of the Entry and the Initial Organization and Operations phases by AIR judges, have already been discussed above.

RECOMMENDATIONS

Several recommendations pertaining to the organization of shelter manager guidance and its placement in the shelter were generated by our laboratory and test experiences. The first is that the guidance materials should be centrally located in one place, with prominently worded instructions that the materials are for use only by the shelter manager or someone acting in his stead. In the emergent-leader laboratory studies, the guidance materials were picked up by many different persons at the time of entry, scanned, replaced in the envelopes or passed from one person to the next, and carried to all parts of the shelter. This did not represent an efficient use of the materials at that point in the shelter stay. However, it is important that parts of the guidance package be capable of distribution to different individuals simultaneously under the auspices of the shelter manager. This is in line with the shelter management principle of delegation of authority. The ideal method for implementing this would be separate materials in the form of cards that the manager could distribute to the appropriate teams. If, in addition, the Shelter Manager's Guide is bound in a loose-leaf fashion, it would have the advantage of permitting easy updating of guidance materials during peacetime.

In large shelters or those with physically separated areas, it is highly desirable that more than one set of guidance materials be available

for use in an emergency. One set per floor or separate area is a conservative recommendation.

It is also recommended that the shelter manager, once he has been assigned to a facility, be given a set of guidance materials that he can keep up-to-date and ready to use.

The goal of developing the most effective set of in-shelter management guidance materials possible suggests that further research be performed along the following lines:

1. Shelter management guidance. The unique management requirements of the large, high-rise shelter have not as yet been systematically investigated. It is possible that some large shelters can realistically be organized and operated as a loose confederation of semi-autonomous small shelters. Other types of large shelters appear, on the face of it, to require tight, centralized control. The role of in-shelter management guidance in each case very likely differs.

2. Use of guidance in emergencies. The shelter guidance experiment revealed important differences in the manner in which subjects responded to similar guidance content formatted differently. However, format was not explicitly considered as one of the experimental variables. Further experimental work can assist in uncovering the combination of format, typography, and wording that will make the Shelter Manager's Guide a maximally useful resource in the event of an emergency.

3. Shelter contingency. The procedures for handling "normal shelter living" have been identified and considered in this project. However, little systematic analysis has been given to the identification of all shelter contingencies or emergencies, their impact on shelter survival, and their implication for shelter management. Further research to develop and test contingency procedures is therefore recommended.

APPENDIX A

McBEE PUNCH CODE: IN-SHELTER GUIDANCE

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McBEE PUNCH CODE: IN-SHELTER GUIDANCE

SIDE ONE: FUNCTIONAL AREAS

1. Radiological Protection
2. Blast
3. Thermal
4. Safety
5. Fire
6. Security
7. Repair and Maintenance
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9. Temperature Control
10. Food
11. Water
12. Sleep
13. Sanitation
14. Medical Care
15. Power
16. Illumination
17. Noise
18. Odors
19. Communication
20. Shelter Command
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22. Shelter Administration
23. Social Control
24. Supply Management
25. Psychological Support
26. In-Shelter Training
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31. Initial Organization and Operations
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34. Pre-Emergence
35. Contingencies

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- B Preparation
- C Distribution
- D Application (or Consumption)
- E Disposal
- F Storage
- G Prevention (Effects)
- H Detection/Diagnosis/ Monitoring
- I Control
- J Protective Actions
- K Decontamination
- L Operation
- M Groupings (Community)
- N Assignment (Functional Teams and Tasks)
- O Orientation
- P Procurement
- Q Investory
- R Rationing
- S Training

SIDE FOUR: VARIABLES

- AG Shelter Capacity
- AL Overcrowding
- C Shelter Type
- CO Shelter Configuration
- CR Management Characteristics
- CU Shelteree Characteristics
- FE Children
- MG Illness
- MN Aged
- MO Special Behavioral Problems (Alcohol, Drugs, Disturbed, etc.)

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13. ABSTRACT

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